REMARKS

Claims 1-17 are all the claims pending in the application. Claims 1-4, 6, 7, 9, 10, and 13 stand presently rejected under 35 U.S.C. § 103(a) as being unpatentable over Maeda (JP 4-284484) in view of Chosa et al (US Patent No. 6,219,074 B1). Further, claims 11 and 12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Maeda in view of Chosa et al., and further in view of Oku (JP 63271484). In addition, claims 14-17 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Maeda in view of Chosa et al. and Murano (US Patent No. 5,444,520). Claims 5 and 8 are allowed.

Fig. 1 of the present application shows a side-printing device 10 having a printing head 11, a controller 12, a suction drum 13, and a rotary encoder 14. A photo film web 15 is supported on and conveyed through the suction drum 13 in a film conveying direction indicated by an arrow in Fig. 1. Further, the printing head 11 has an LED array unit 20 (see Fig. 2) and a converging lens system 16.[1]

As shown in Fig. 2, the LED unit 20 has a substrate 21, LED chips 22, partitioning plates 23, and a diffusion plate 24. Therein, the LED chips 22 are arranged on the substrate 21 in a direction that is perpendicular to the film conveying direction. Also, each of the LED chips 22 is assigned to record a dot as a pixel of a latent image 15a (see Fig. 1) that is photographically recorded on the photo film web 15. The partitioning plates 23 partition the individual LED chips 22 from each other and prevent mixture or interference between rays that are emitted from the

[1] See specification on page 7, ln. 19-27

adjacent LED chips 22, and thus prevent confusion between the pixels. The diffusion plate 24 is placed above the partitioning plates 23 for diffusing rays from the LED chips 22 to project light beams of an uniform luminance for each pixel.[2]

Independent claim 1 is directed to an optical printing head of a side-printing device for printing data of a photosensitive material, wherein the optical printing head comprises a plurality of light emitting elements mounted on a substrate; a partitioning device mounted on the substrate for partitioning the light emitting elements from each other; a diffusion device for diffusing rays from the light emitting elements; and a converging lens system for projecting rays from the light emitting elements onto the photosensitive material.

Claim 1 is one of the claims presently rejected under 35 U.S.C. § 103(a) as being unpatentable over Maeda in view of Chosa.

As recognized by the Examiner on page 3, first full paragraph, of the present Office Action, the Maeda reference does not teach or suggest "a converging lens system for projecting rays from said light emitting elements onto said photosensitive material", as claimed in claim 1. However, according to the Examiner, the Chosa reference allegedly discloses "a lens system for condensing the light to the recording paper (3)". In addition, the Examiner states that "[t]he conventional lens system (8, Fig. 27) can also be used to condense the light."

Fig. 27 of the Chosa reference shows a printing head unit including a printed circuit board 1, LED elements 4 (only one is shown for simplicity), a plate 2 having an aperture 9, and a

[2] See specification on page 8, ln. 1-16

spherical lens 8. The LED elements 4 emit light, which is focused upon a pixel on a recording paper 3 via the aperture 9 and the spherical lens 8 located directly above each of the LED elements 4.[3]

However, Applicants note that the Chosa reference nowhere teaches or even suggests that the printing head unit shown in Fig. 27 can include e.g. "a partitioning device ... for partitioning said light emitting elements from each other to prevent interference between rays from adjacent ones of said light emitting elements" and/or "a diffusion device for diffusing rays from said light emitting elements to equalize luminance of rays from each light emitting element", as claimed in claim 1. As such, it is not apparent how or why a person skilled in the art would have been motivated from Chosa's disclosure regarding Fig. 27 to include the spherical lens 8 into an optical printed head as claimed in claim 1 (which recites the above-cited partitioning device and/or diffusion device).

Furthermore, the grounds of rejection state on page 3, second full paragraph, of the present Office Action that "Chosa et al. ... disclose an image forming apparatus including light-emitting elements (4) mounted on a substrate or circuit board (1), thick partitioning side walls (12, Fig. 4B) to shield the light from each [sic: one] of the light-emitting elements as well as [sic: to reflect] the light emitted from the light-emitting element back to the aperture (7p), the plate (7) having light-passing areas (7p) provided in the light-emitting direction of the light-emitting elements". In addition, the grounds of rejection appear to suggest that "a lens system for

[3] See Chosa reference, col. 2, ln. 6-50

condensing the light to the recording paper (3)" is included in embodiments having the above-mentioned structures 1, 4, 7, 7p, and 12.

However, Applicants note that the Chosa reference expressly teaches that the light-emitting device in accordance with Chosa's invention (preferred embodiments of which can include the structures 1, 4, 7, 7p, and 12) is a lightweight and miniaturized device (as compared to the conventional system shown in Fig. 27), since, contrary to the conventional system of Fig. 27, no lens is used.[4]

In other words, contrary to the statements in the grounds of rejection, the disclosure of the various embodiments of Chosa's invention clearly teaches away from providing "a converging lens system for projecting rays from said light emitting elements onto said photosensitive material", as claimed in claim 1. Therefore, a person skilled in the art would not have been motivated to combine the teachings of the Chosa reference with the teachings of the Maeda reference so as to arrive at the invention claimed in claim 1.

Further, the Chosa reference teaches that a distance between the light-emitting section of the LED element and the recording paper is shortened by omitting a lens optical system because the radiation power increases as the inverse square of the distance.[5]

By contrast, referring to the present application, an LED is a planar light-emitting source. Without a lens optical system, the optical image from the LEDs is out of focus, which causes a

[4] See Chosa reference, col. 22, ln. 37-40 (emphasis added)

[5] See Chosa reference, col. 6, ln. 35-44

decrease in image resolution. The provision of the claimed lens optical system increases the resolution of the side-printed image as well as the amount of the printing light from the LEDs.

For at least these reasons, Applicants submit that independent claim 1 is patentable over the prior art made of record. The dependent claims 2-13 are patentable at least by virtue of their dependency from claim 1.

Fig. 12 of the present application shows a side-printing head 64 provided with three LED array units 65, 66, and 67 for emitting rays of red, green, and blue light, respectively. A dichroic mirror 68 lets the red rays from the LED array unit 65 pass through and reflects the green rays from the LED array unit 66 so that the red and green rays are directed toward a second dichroic mirror 69. The second dichroic mirror 69 lets the red and green rays pass through and reflects the blue rays from the LED array unit 67 so that the red, green, and blue rays are directed toward the projection lens 70.[6]

Independent claim 14 is directed to an optical printing head, which comprises, among other things, "dichroic mirrors for mixing the rays from three colors from said three light emitting array units." Therein, as known to a person skilled in the art, a dichroic mirror is a mirror that reflects certain colors of light while allowing others to pass through.

Claim 14 is one of the claims rejected under 35 U.S.C. § 103(a) as being unpatentable over Maeda in view of Chosa et al. and Murano. In particular, the grounds of rejection allege that the reference numerals 82, 148, and 150 of Murano refer to dichroic mirrors.

However, Applicants note that Murano merely teaches that the reference numerals 82, 148, and 150 in Fig. 15 designate "half-mirrors", which are mirrors that have the same transmittance and the same reflectivity so that there will be no non-uniformity in the amount of light on the photoconductor drum 02.[7] In addition, the Murano reference merely teaches that the half-mirror 82 shown in Fig. 14 transmits the rays from lenses 12-1 to form an image on the image formation plane 01, and reflects the rays from lenses 12-2 to form an image on the image-formation plane 01.[8]

There is, however, no teaching or suggestion anywhere in the Murano reference that the mirrors 82, 148, and 150 are "dichroic mirrors", as claimed in claim 14, i.e., mirrors that reflect certain colors of light while allowing others to pass through. In fact, the Murano reference nowhere teaches or even suggests that the LED arrays 4 shown in Figs. 14 and 15 are LED arrays that transmit light of different colors. Therefore, Applicants submit that the "dichroic mirrors for mixing the rays of three colors from said three light emitting element array units" claimed in claim 14 are nowhere disclosed in the Murano reference.

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[7] See Murano reference, col. 16, ln. 10-15

[8] See Murano reference, col. 13, ln. 30-33; col. 14, ln. 38-47

For at least these reasons, Applicants submit that independent claim 14 is patentable over the prior art made of record. Dependent claim 15 is patentable at least by virtue of its dependency from claim 14.

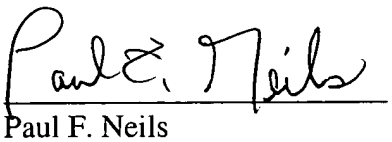
Independent claim 16 recites "light emitting elements emitting rays of one of said three colors" and is also rejected under 35 U.S.C. § 103(a) as being unpatentable over Maeda in view of Chosa et al. and Murano. However, as discussed above in connection with the patentability of claim 14, the Murano reference nowhere teaches that the LED arrays 4 in the LED heads A, B, C, D shown in Fig. 15 emit light of different color. In fact, the grounds of rejection themselves fail to provide any citation to where in the Murano reference it is allegedly taught or suggested that the LED heads A, B, C, D emit "rays of one of said three colors", as recited in claim 16.

For at least reasons, Applicants submit that independent claim 16 is patentable over the prior art made of record. Dependent claim 17 is patentable at least by virtue of its dependency from claim 16.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Please change the paragraph on page 1, ln. 17-28, as follows:

Manufacturing processes of photosensitive materials include a side-printing process for photographically printing film data in the form of characters, marks and bar codes on a side margin of the photosensitive material outside those areas used for photographing picture frames. The film data printed on the side margins includes a manufacturer's name, and ISO sensitivity or film speed of the photosensitive material. The film data is side-printed as a latent image and is developed as visible images concurrently with the picture frames photographed on the photosensitive material. Thereafter, the film data is manually or mechanically read out and utilized as film data for controlling printing the photographed images.